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Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Caledon WEF EIA (Arcus Gibb/ Genesys)

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4.2 The specialist appointed in terms of the Regulations_

I, **Nick Helme** , declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Nick Helme Botanical Surveys

Name of company (if applicable):

30 Oct 2011

Date:

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SPECIALIST IMPACT ASSESSMENT FOR PROPOSED WIND ENERGY FACILITY NEAR CALEDON, WESTERN CAPE: VEGETATION COMPONENT

Prepared for: Arcus Gibb (Pty.) Ltd., Johannesburg

Client: GenesysWind (Pty) Ltd.

November 2011

EXECUTIVE SUMMARY

This botanical impact assessment was requested in order to help inform decisions regarding the establishment of a proposed private wind energy facility (WEF) on a site in the Caledon area of the Overberg region (Western Cape). The study area is approximately 3 500 ha in extent, lies north of the N2 highway, straddles the R43 to Villiersdorp, and is about 13km northwest of Caledon.

No alternative infrastructure layouts were provided for assessment at this phase. The assessed layout includes up to 74 wind turbines (each of up to 3.6 MW), which includes two phases, the first of which would include 17 turbines (50MW). The proposed WEF would also include a new substation (one for each phase), internal access roads, underground cabling, and a maintenance / control building (existing building in Caledon).

The study area is within the Cape Lowlands Renosterveld Project study area, which identified the majority of the study area as part of a key Renosterveld ecological corridor from the Van der Stel's Pass (in the west) to the Snyerskraalkoppe west of Greyton. The area was also included within the priorities for 20 year conservation action (von Hase *et al* 2003).

There are two natural vegetation types in the study area – Western Ruens Shale Renosterveld and Overberg Sandstone Fynbos. Both are nationally recognised as threatened, with the former being Critically Endangered in terms of the National Spatial Biodiversity Assessment (Rouget et al 2004) and the Draft National List of Threatened Ecosystems (DEA 2009), whilst the latter is regarded as Critically Endangered in terms of the Draft National List of Threatened Ecosystems (DEA 2009). Thus all remaining natural vegetation in the study area is of High sensitivity and conservation value.

About 75% of the remaining natural vegetation in the study area is Western Ruens Shale Renosterveld (mostly in lower and western parts of study area). Natural vegetation covers an estimated 20-35% of the study area (300 – 700ha), which is an exceptionally high figure for the Overberg, and is due to the unusually hilly topography, which has prevented ploughing and cultivation of the steeper slopes. The vegetation in the study area ranges in condition from totally transformed (about 60% of the area, corresponding mainly to the cultivated lands) to pristine.

Disturbance in the area includes cultivation (mainly for cereals and grazing for sheep), heavy grazing and trampling by cattle and sheep, and alien vegetation invasion. The most heavily disturbed areas are those that have been regularly ploughed and sown with crops, and these areas generally have no botanical value. About 60% of the overall study area falls into this latter category.

Development within High sensitivity areas (*i.e*. any areas of natural vegetation) is not recommended, as it will result in permanent loss of Critically Endangered vegetation and possibly also of associated Species of Conservation Concern, and the impacts cannot be effectively mitigated.

The following potentially positive ecological impact has been identified:

- Opportunity to formally conserve and manage significant priority areas of natural habitat on site (basically an on-site conservation contribution), preferably as Contract Reserves with CapeNature's Stewardship Program.

The primary negative impacts are largely the result of direct factors. Direct impacts include loss of Critically Endangered natural vegetation (<1.2ha) in development footprints, and direct, long term loss of natural vegetation (2-3ha) in areas that will be disturbed by heavy construction machinery, cable trench and power line installation, temporary dumping of building material, etc.

Most (but not all) impacts on High sensitivity vegetation can be avoided by relatively minor changes to the layout. It should be noted that, even if the five problematic turbine positions are eliminated or relocated to low sensitivity areas, access roads and cable trenches will still need to cross three High sensitivity areas of natural vegetation on the main summit ridge, in order to connect three discrete areas of cultivated land. There will be unavoidable loss and damage to vegetation in these areas.

Indirect impacts are often difficult to quantify and avoid. The indirect botanical impacts of the proposed development are likely to be negligible in relation to the existing and ongoing agricultural impacts on the site (*e.g*. agricultural expansion; alien vegetation invasion; grazing; fertiliser and pesticide usage and drift).

Cumulative effects are in many respects regional effects, and the impacts of this type of development will be significantly less than for various existing and ongoing agricultural operations in the region, as well as for the many unmanaged

and expanding alien plant invasions on numerous properties in the region (including those on site).

If >98% of the proposed development footprint can be restricted to areas of Low botanical sensitivity (as will be the case after proposed mitigation) the direct impact on natural vegetation will be minimised and overall botanical impact will be acceptable.

The possible positive direct impact depends to a large degree on the management of the remaining High Sensitivity natural vegetation within the study area as a conservation area (Ruens Shale Renosterveld is very under-conserved, with less than 1% conserved), and the removal of livestock from the Renosterveld areas during the main flowering season (May – September). A minor, indirect positive impact is the contribution that this WEF will make to reducing CO_2 emissions, and the associated reduction in global warming effects.

Overall the proposed WEF is likely to have an **unacceptable Medium to High negative impact** on the vegetation on site, **prior to mitigation**. Medium to High levels of botanical impact are primarily the product of direct loss of up to 1.2ha and indirect loss of up to 2-3ha of Shale Renosterveld vegetation, which is a Critically Endangered vegetation type. This could be easily reduced to Low negative with minor layout alteration (moving five proposed turbines and their associated infrastructure out of areas of natural Renosterveld vegetation).

Turbines WT3a, WT5a, WT17, 20 and 36 should be relocated to Low sensitivity areas (*i.e.* currently cultivated areas) or eliminated altogether, as they are all located within natural or partly natural areas of Renosterveld vegetation. Both proposed substation positions (and both alternatives for Phase 2) are in an acceptable location, being located entirely within currently cultivated land.

It may be possible to achieve a Low or even a Medium positive overall impact after mitigation, but this would depend on the above mitigation being implemented, plus management (especially alien vegetation management) and formal conservation of most of the High sensitivity vegetation areas on site under CapeNature's Stewardship program. As this would require negotiation between the landowners, the applicant and CapeNature it is not known whether this is likely to happen, but it remains a recommendation.

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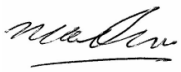
DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.



NA Helme

Abridged CV:

Contact details as per letterhead.

Surname : HELME

First names : NICHOLAS ALEXANDER

Date of birth : 29 January 1969

University of Cape Town, South Africa. BSc (Honours) – Botany (Ecology & Systematics). 1990.

Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-

western Cape. Since the end of 2001 I have been the Sole Proprietor of Nick Helme Botanical Surveys.

A selection of recent, relevant projects undertaken include:

- Scoping and Impact Assessment of Proposed Wind Energy Facility near Swellendam (CSIR 2010)
- Scoping and Impact Assessment of proposed Dassiesfontein Wind Energy Facility near Caledon (Savannah Environmental 2010)
- Scoping and Impact Assessment of proposed West Coast One Wind Energy Facility near Vredenburg (Savannah Environmental 2010)
- Scoping and Impact Assessment of proposed Rheboksfontein Wind Energy Facility near Darling (Savannah Environmental 2010)
- Scoping study of proposed Wind Energy Facility near Britannia Bay (Savannah Environmental 2010)
- Scoping study of Proposed Wind Energy Facility near Bredasdorp (CSIR 2010)
- Impact Assessment of proposed Blue Crane Signature Golf Estate, Caledon (Doug Jeffery Environmental Consultants 2010)
- Basic Assessment of proposed development of portion of Erf 1 (Extension 12), Caledon (EnviroDinamik; 2010)
- Scoping study of Proposed Wind Energy Facility near Caledon (Arcus Gibb 2009)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Hopefield (Savannah Environmental 2008 & 2009)
- Scoping study of Proposed Wind Energy Facility near Vredendal (DJ Environmental 2009)
- Scoping and Impact Assessment of Proposed Wind Energy Facility west of Bitterfontein (DJ Environmental 2009 & 2010)
- Scoping and Impact Assessment of Proposed Wind Energy Facility near Springbok (DJ Environmental 2009 & 2010)
- Scoping and Impact Assessment of Proposed Wind Energy Facility near De Aar (DJ Environmental 2009 & 2010)

1. INTRODUCTION

This botanical impact assessment was requested in order to help inform decisions regarding the establishment of a proposed commercial wind energy facility (WEF) on a site in the Caledon area of the Overberg region (Western Cape). The study area is approximately 3500 ha in extent, lies north of the N2 highway, straddles the R43 to Villiersdorp, and is about 13km northwest of Caledon.

No alternative infrastructure layouts were provided for assessment at this phase. The assessed layout includes up to 74 wind turbines (each of up to 3.6 MW), which includes two phases, the first of which would include 17 turbines (50MW). The proposed WEF would also include a substation, internal access roads, underground cabling, and a maintenance /control building. A further substation would be required for phase two.

The botanical Scoping study for this project was completed in November 2009 (Helme 2009).

2. LIMITATIONS AND ASSUMPTIONS

The baseline information about the vegetation of this site is contained in Helme (2009) and is not comprehensively repeated in this Impact Assessment report.

I was told that all the proposed turbines and infrastructure (except the powerline connecting the facility to the existing Eskom powerline) would be located entirely in currently cultivated areas (Mr. Dion Wilmans of Genesys – pers. comm.), and this informed the level of detail in the baseline study to a large extent. Property boundaries were assumed to be as indicated on the map provided in October 2009, which was used as a base map.

A very brief site visit was undertaken on 27 October 2009. Due to severe time constraints I was unable to visit the site again before the report was due on 9 November 2009. In addition, the study area quoted for was 1400ha, but the study area indicated to us after the site visit was more than double this size, and the study area as now portrayed is effectively 3500 ha. I was unable to undertake detailed botanical observations on much of the site during the initial site visit, but fortunately I have previously sampled in numerous localities within the study area, mostly as part of the fieldwork undertaken for the Cape Lowlands Renosterveld Project (Von Hase *et al* 2003). The author is familiar with large parts of the study area, and was able to confidently interpret the October 22

2009 Google Earth imagery for this area, which was used as a basis for this assessment. After the site visit I drove the Hawston View road down to Van der Stel's Pass, passing under the existing Eskom 132kV powerlines, and was able to briefly examine this part of the study area. Given the time constraints and information from the client that "all infrastructure would be located within cultivated areas" (D. Wilmans – pers. comm.) the primary focus of this study was thus to compile a botanical constraints map to further inform the planning process. This meant that a habitat based approach was used as a primary informant, supplemented by a species based approach, drawing on experience in similar habitats in the region. Conservation value and sensitivity of habitats are a product of diversity, rarity of habitat, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats. Given that all remaining natural vegetation in the study area is classified as Critically Endangered on a national basis (DEA 2009 and Rouget et al 2004) it was assumed that all remaining areas of natural vegetation on site are of High botanical sensitivity and conservation value.

I was able to access the GIS based rare species information (CapeRares database) maintained by CREW (Custodians of Rare and Endangered Wildflowers, based at SANBI, Kirstenbosch). Areas were mapped directly on to an aerial photograph of the study area. Confidence levels in the broad brush botanical sensitivity mapping is regarded as high, as the Google Earth imagery for the area is dated October 22 2009, and is thus relatively current and an accurate image of the current landuse status.

It is assumed that the Google Earth based layout provided by Genesys Wind on 24 January 2011 is 95% spatially accurate, although it is clear that certain infrastructure is not optimally situated from a botanical point of view, and the identification of such is one of the primary aims of this report. Furthermore, it is clear from the mapping provided that "sloppy" digitising is a problem in the layout, as although access roads and cable trenches are supposedly closely parallel throughout the site these in fact are shown diverging by as much as 150m at certain points. In many cases these divergences, if taken literally, would mean significant botanical impacts, as they (and particularly the cable trenches) often cross areas of sensitive natural vegetation. I have assumed that the mapping is merely the result of sloppy digitising and that the roads and cable trenches will in fact be closely parallel as indicated by the applicant and Arcus Gibb, and will in fact never diverge by more than 12m, and that the cable

trenches will closely follow the roads (which are hopefully more accurately shown).

As for all other wind farm assessments undertaken (see page vi) it is assumed that the wind turbine foundations will permanently disturb an area of up to 13 m by 13 m; that any permanent gravelled internal access roads will be 6m wide, that adjacent laydown areas will temporarily disturb areas of up to 40m by 40m (or 20m by 70m), and possibly permanently disturb areas of up to 20m by 20m; and that the compacted area (long term to permanent disturbance) for crawler crane travel will be 10- 13m wide and parallel to and inclusive of the 6m wide gravelled roads (and thus 3m either side of the gravel roads). Disturbance corridors for underground cabling are estimated at up to 6m wide (3m for the trench and digger track, 3m for the temporary placement of soil).

The proposed substation locations are indicated in Figure 2a (Phase 1) and 2b (Phase 2). The proposed control building would be an existing structure in Caledon itself (Chapter 3 of Arcus Gibb project information document). The proposed construction camp and main laydown area is just north of the De Vleytjes werf, east of the R43, within a cultivated area.

It is assumed that road gravel, if needed (deemed unlikely, as soils on site are naturally gravelly), will come from existing, authorised borrow pits off-site.

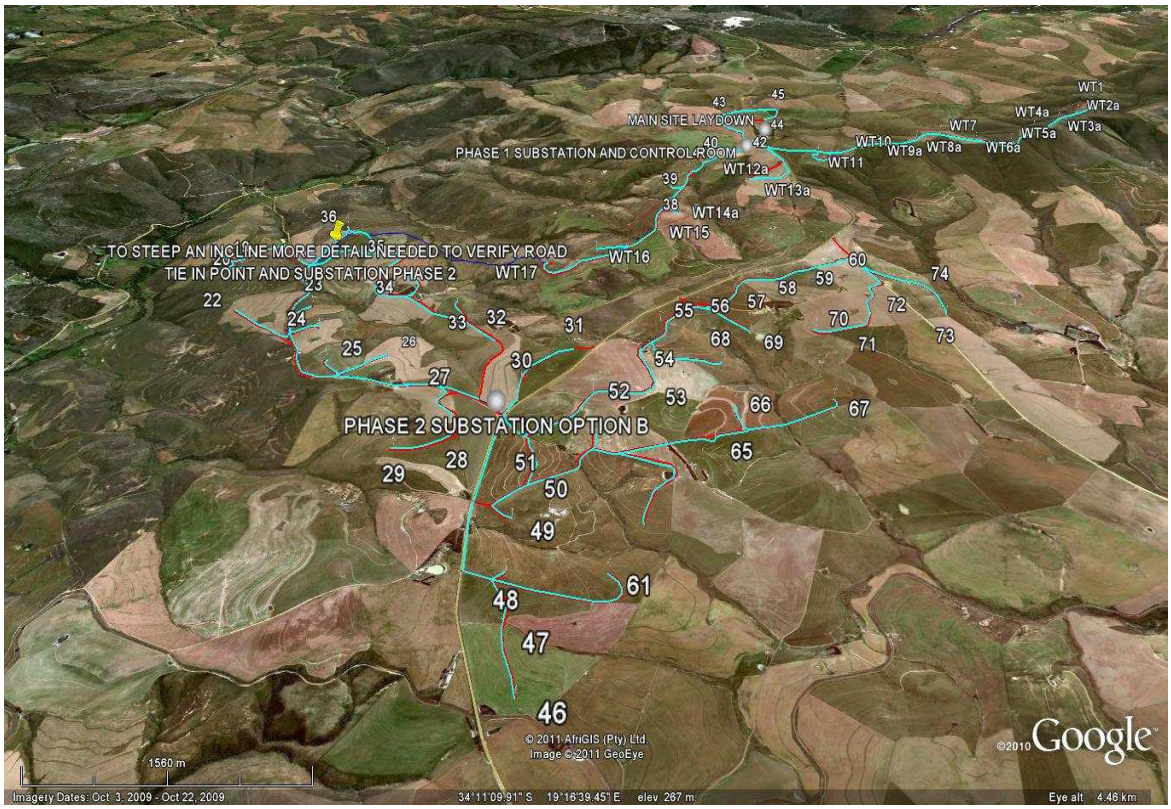


Figure 1: Oblique Google Earth view of proposed turbine layout (numbers next to turbines).

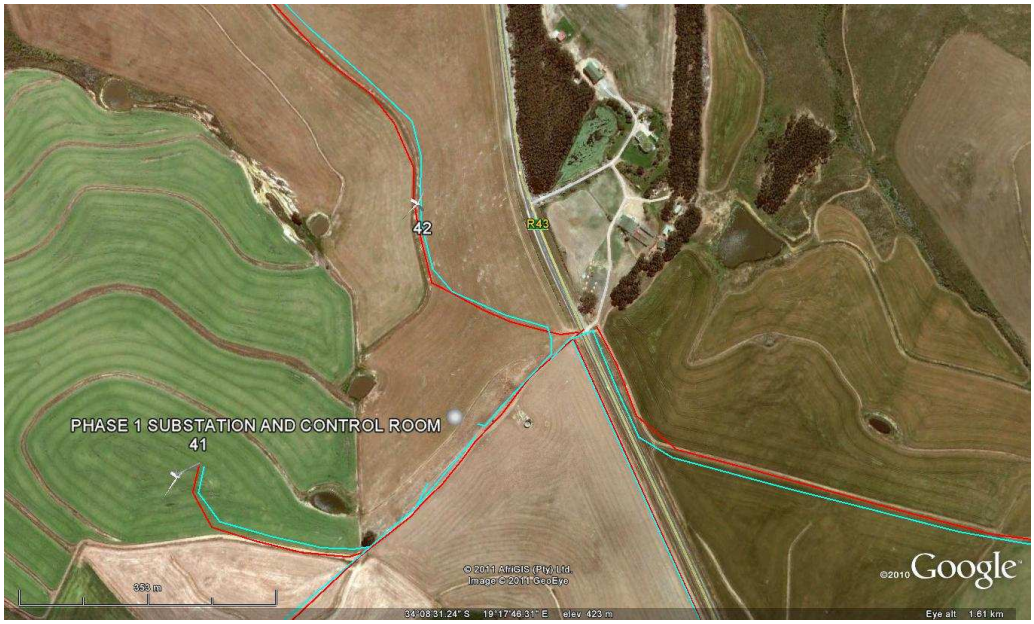


Figure 2a: Image showing proposed position of Phase 1 substation, just southwest of De Vleytjes house.

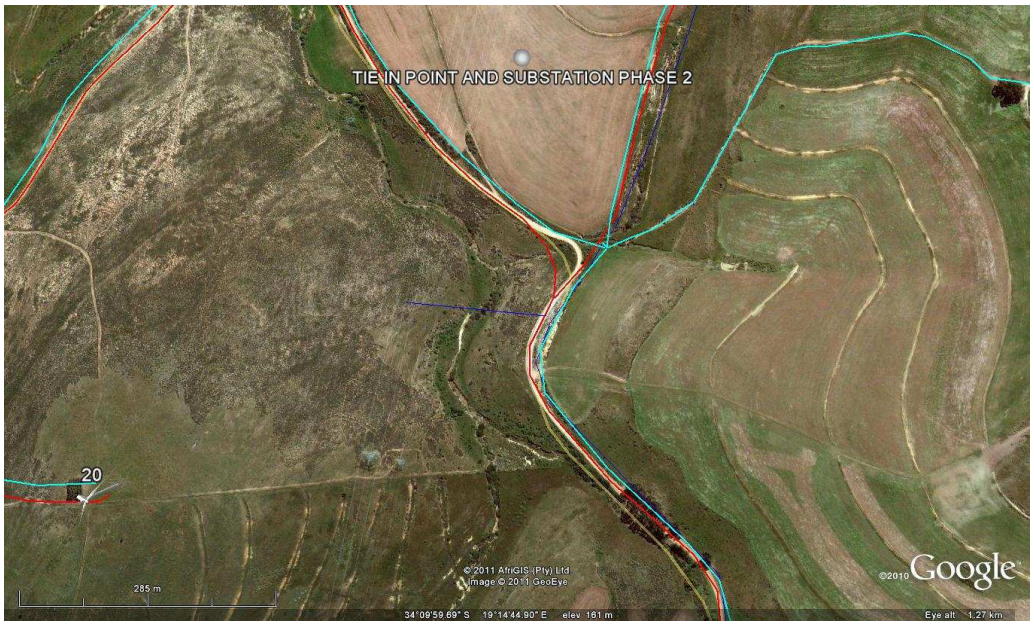


Figure 2b: Image showing proposed position of Phase 2 substation (alternative 1).

3. TERMS OF REFERENCE

Terms of reference (TOR) for the Scoping and IA phases were the standard TOR as proposed by CapeNature, and DEA&DP's guidelines for biodiversity assessment (Brownlie 2005) were also adhered to. The CapeNature TOR are as follows:

- Produce a baseline analysis of the botanical attributes of the property as a whole (see Helme 2009).
- This report should clearly indicate any constraints that would need to be taken into account in considering the development proposals further (see Helme 2009).
- The baseline report must include a map of the identified sensitive areas as well as indications of important constraints on the property. It must also (see Helme 2009 for most of below information):
    - Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.
    - In terms of biodiversity pattern, identify or describe:

Community and ecosystem level

a. The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;

b. The types of plant communities that occur in the vicinity of the site
c. Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, etc.)*

Species level

d. The presence of any plant Species of Conservation Concern (SCC)
e. The viability of and estimated population size of the plant SCC present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
f. The likelihood of other SCC occurring in the vicinity (include degree of confidence).

Other pattern issues

g. Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
h. The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
i. The condition of the site in terms of current or previous land uses.

In terms of **biodiversity process**, identify or describe:

j. The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
k. Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
l. Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
m. Would the conservation of the site lead to greater viability of the adjacent ecosystem?

- Would the site potentially contribute to meeting regional conservation targets for both biodiversity pattern and ecological processes?
- Is this a potential candidate site for conservation stewardship?

- What is the significance of the potential impact of the proposed project – with and without mitigation – on biodiversity pattern and process at the site, landscape, and regional scales? Include comment on cumulative impacts.
- Provide a map, at suitable scale, of key conservation areas and corridors.
- Recommend actions that should be taken to prevent or mitigate impacts. Indicate how these should be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity.
- Indicate limitations and assumptions, particularly in relation to seasonality.

4. METHODOLOGY

The study approach was partly informed by the guidelines prepared by Brownlie (2005), and also by the TOR. Vegetation types used are as defined in the SA vegetation map (Mucina & Rutherford 2006), and ecosystem status is as per the National Spatial Biodiversity Assessment (Rouget et al 2004) and the subsequent Draft National List of Threatened Ecosystems (DEA 2009). Red List status of plant species is according to Raimondo et al (2009).

For previous records of rare plants in the area I was able to access the GIS based information on the Cape Rares database (Spatial layer of rare and threatened plant localities managed by the Threatened Species Programme of SANBI (January 2007), plus collections and observations made by this author over the last twelve years.

Subsequent to the baseline report of Helme (2010) all areas of elevated botanical sensitivity (areas of natural vegetation) were mapped on the October 2009 Google Earth imagery and saved as .kmz files, and were then forwarded to the planning team, which has subsequently endeavoured to avoid most of these areas.

In late 2010 Dr D. Hoare (an independent consultant base in Pretoria) was asked by the applicant to compile a vegetation and landuse map of the study area, and this is included in the current report as Figure 4.

Permanent loss of any area of a Critically Endangered vegetation type is deemed to be have a High negative botanical impact, as by definition the national conservation targets for Critically Endangered vegetation types cannot be

achieved, due to previous, extensive habitat loss (Rouget et al 2004), and thus no further loss should be tolerated.

5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Regional context

The primary description and mapping of the vegetation in the area can be found within the scoping study (Helme 2010), and is not repeated here in full.

The study area lies within the Fynbos biome and the Cape Floristic Region (CFR). The CFR is one of only six floristic regions in the world, is the richest temperate flora in the world, and is the only one confined to a single country. It is also by far the smallest floristic region, occupying only 0.1% of the world's land surface, and supporting about 9000 plant species - almost half of all the plant species in South Africa. At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Most of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. Data from the Red Listing process recently undertaken for South Africa is that 67% of the threatened plant species in the country occur only in the Fynbos biome, and these total over 1800 species (Raimondo *et al* 2009). It should thus be clear that the south-western Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species. Developments in this area thus need to take this into account.

The study area is part of the greater Overberg bioregion (also known as the Ruens), which is a major grain producing area. Due to the high agricultural potential of the shale-derived soils the loss of natural vegetation to agriculture has been severe (>85% lost), and the bioregion has a very large number of threatened plant species (probably more than 300; Raimondo *et al* 2009).

The Cape Lowlands Renosterveld Project (Von Hase *et al* 2003) identified much of the natural vegetation in the study area as core areas for conservation, and included most of it within the proposed 20 year vision of this project. This effectively means that within twenty years the formal conservation of the Renosterveld in this area will have been achieved (by means of signed CapeNature Stewardsip contracts with landowners). Up until now there have been

few Stewardship contracts signed with landowners in the area (C. Martins - pers. comm), but there have been a few contracts signed with landowners just outside the study area, and these contracts effectively formalise the conservation of the natural vegetation in these areas, and are associated with certain financial (tax related) incentives for the landowners.

The primary reasons for including the natural vegetation in this area as core areas were the ecological connectivity value of the area, linking the Groenlandberg to the Greyton and Snyerskraalkoppe, the relatively large extent of remaining Renosterveld, and the known occurrence of various threatened plant species in the area (Von Hase *et al* 2003).

5.2 Ecological drivers

Soil type is normally a key driver of vegetation type differences, but is rather consistent across the study area, with nutrient rich shale-derived soils having resulted in Renosterveld vegetation throughout the study area (at least prior to cultivation and loss of natural habitat).

Fire is a key ecosystem driver in Renosterveld habitats (De Villiers 2005). It is essential that the various Renosterveld types burn once every 12 to 25 years, as many of the species are adapted to regular fires and will only flower or germinate from seed after a fire. Fires at a frequency greater than this will dramatically reduce overall species diversity, and fires less often than once every 25 or 30 years will lead to gradual senescence of many species, and hence local extinctions. Appropriate fire frequencies are strongly influenced by prevailing climatic conditions, with drier areas being able to tolerate longer gaps between fires. An estimated 30-40% of the natural vegetation in the area has been burnt within the last ten years, and the rest is older than ten years, and in some cases is probably older than twenty years (pers. obs.).

An additional ecological driver is soil moisture; with distinct plant communities (and many rare species) associated with seasonally damp drainage lines, which comprise less than 10% of the overall site. Unfortunately some of these drainage lines have generally been heavily invaded by *Acacia saligna* (Port Jackson willow), which has resulted in reduced water availability, and increased shading, and others have been impacted by runoff from farming operations, leading to alien grass invasions, notably *Lolium* species (ryegrass).

5.3 Vegetation overview

Prior to agriculture about 75-80% of the overall study area supported Western Ruens Shale Renosterveld, with Greyton Shale Fynbos mapped as occurring on the northeastern ridge (Mucina & Rutherford 2006; see Figure 3).

Western Ruens Shale Renosterveld has been very heavily impacted by agriculture within the region where it occurs (Botriver to Bredasdorp) and today less than 13% of its original extent remains (Rouget *et al* 2004). The vegetation type is regarded as a **Critically Endangered vegetation type**, with an unachievable national conservation target of 29%, and only 1% conserved (virtually all of this in private reserves; Rouget *et al* 2004). Intact examples of this vegetation type are typically home to a high number of rare and threatened plant species, many of which are endemic (restricted) or near endemic to the vegetation type. The Draft National List of Threatened Ecosystems (DEA 2009) has also classified this vegetation type as **Critically Endangered** (due to high levels of species endemism). About 50% of the remaining vegetation in the study area is of this type.

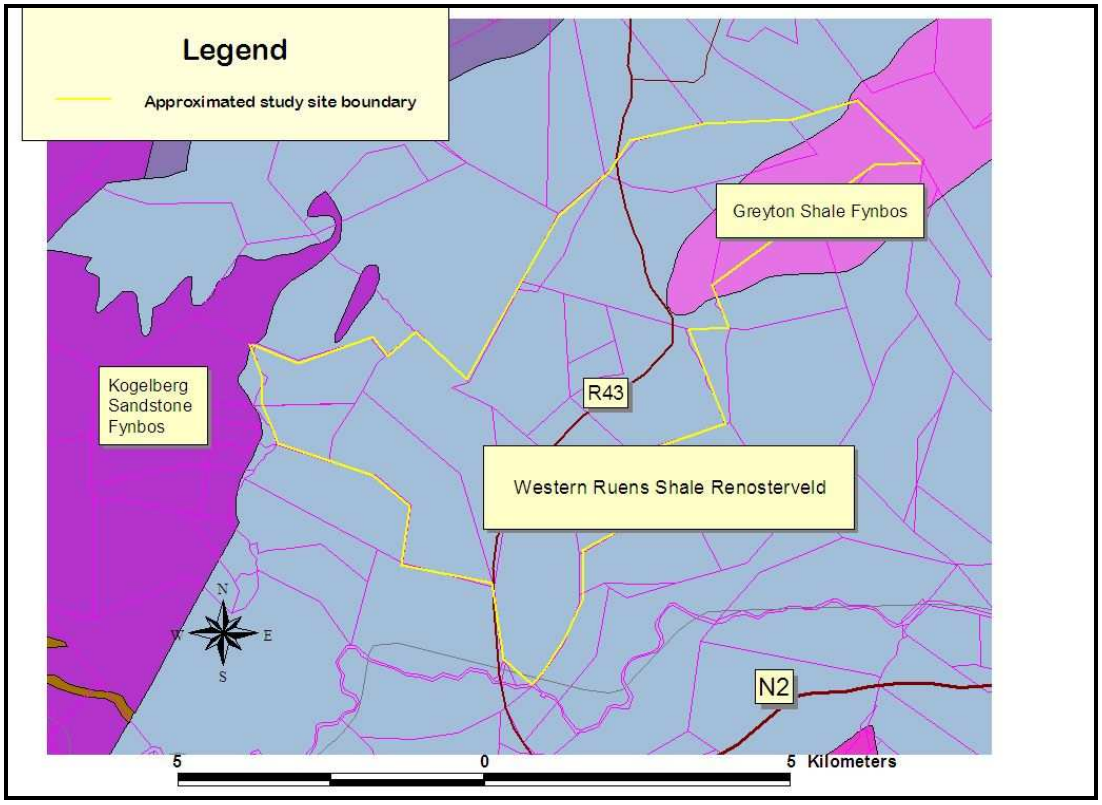


Figure 3: Extract of the SA Vegetation Map (Mucina & Rutherford 2006), showing that most of the site would have originally supported Western Ruens Shale Renosterveld, with Greyton Shale Fynbos in the northeast sector.

Greyton Shale Fynbos is here at its western end, and occurs in the region up to Riviersonderend, usually on the foothills of the Riviersonderend Mts. Some 30% of this vegetation type has been lost, with a conservation target of 30%. However, only 0.8% is formally conserved, with a further 5.8% in private reserves (Rouget et al 2004), and the unit is thus classified as **Vulnerable** on a national basis.

Woody alien invasive vegetation is generally not a major problem within the remaining areas of natural vegetation on site, with the exception of some of the drainage lines, especially in the west, where there are some moderate to dense stands of *Acacia saligna* (Port Jackson). Invasive alien grasses are a major problem in certain areas, especially on damp slopes where natural vegetation lies downslope of cultivation (due to fertiliser leaching downhill). The primary invasive grasses are species of *Lolium* (ryegrass), although *Hyparrhenia hirta* (thatching grass) can also be a problem. In areas close to agriculture various alien herbs can also be an issue, such as *Echium plantagineum* (Patterson's curse) and *Vicia benghalensis* (purple vetch).

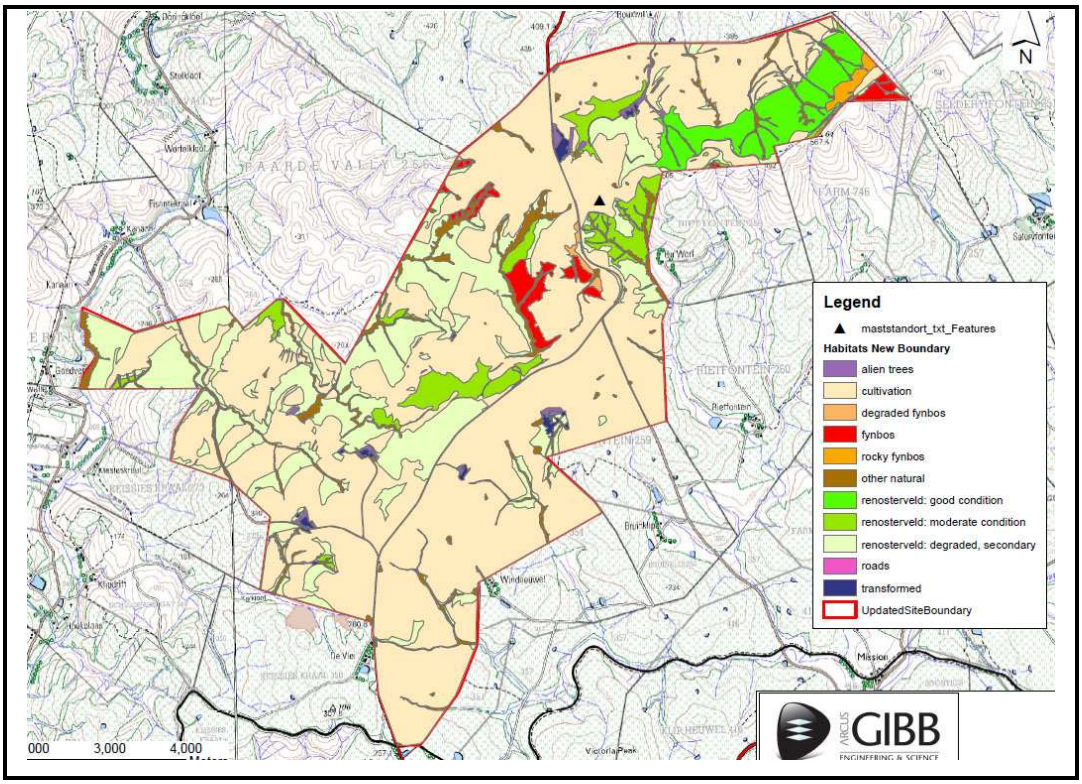


Figure 4: Copy of vegetation and landuse map of the study area prepared by D. Hoare in late 2010.

5.2 Plant Species of Conservation Concern

As many as 15 to 20 threatened plant species may occur within the study area or its immediate surrounds, and all these would occur within the areas of remnant natural vegetation (High sensitivity areas mapped in Helme 2009; and within areas mapped as Fynbos or Rocky Fynbos or Renosterveld: good condition or Renosterveld: moderate condition in Figure 4). This is an exceptionally high figure, even for the Fynbos biome, and is indicative of the conservation importance and sensitivity of all remaining natural habitat in the area.

Plant Species of Conservation Concern known to occur within the study area include *Moraea atropunctata* (Florishoogtepoublom; Critically Endangered), *Freylinia helmei* (Vulnerable), *Peucedanum pungens (*Endangered), *Adenandra multiflora* (Vulnerable), *Euchaetis schlechteri* (Vulnerable), *Sparaxis fragrans* (Vulnerable), *Bulbinella barkerae* (Near Threatened), and *Ixia trinervata* (Near Threatened), and significant numbers of others are likely to occur.

The small but very striking bulb *Moraea atropunctata* is in fact endemic to the study area (found nowhere else in the world), but will not be impacted by the

proposed development layout, although a small (<30 plants) and declining subpopulation was observed along the fenceline about 150m south of the proposed Phase 1 substation some eight years ago (pers. obs), and may still be present in this area, in which case it is likely to be impacted by proposed roads and cable trenches.

The localised and currently undescribed buchu *Agathosma nigromontana* may also occur on the site (T. Trinder-Smith – pers. comm.), but flowers only in July, which is not a time when the site has been surveyed.

6. DESCRIPTION OF ISSUES IDENTIFIED AT THE SCOPING STAGE

Most of the key issues were included within the conclusions of the vegetation scoping document (Helme 2009), and the relevant ones are repeated here, and some are expanded:

- Loss of natural vegetation during the construction stage is likely to be the primary botanical impact. About half will be permanent, and the other half will be temporary, as trampled and partly disturbed areas should eventually recover.
- The least sensitive areas are the previously or currently cultivated areas, which have a Low sensitivity on a regional scale. In order to minimise direct impacts on the vegetation these are the areas where all proposed infrastructure (such as the substations, turbines, roads, construction camp, and operations base) should be placed, if possible.
- Indirect negative effects (habitat fragmentation, disruption of natural fire regime, possible introduction and spread of alien invasive plants and insects) are likely to be relatively insignificant, especially in the context of the ongoing farming operations in the area.
- Cumulative negative effects are likely to be negligible, at least after mitigation.
- It is recommended that roads (and cable trenches) though areas of natural vegetation be kept to a minimum during planning, construction and operational stages, as this will be one of the primary sources of direct vegetation loss, alien plant and insect introduction, and habitat fragmentation (the latter both indirect effects).
- Indirect botanical impacts after mitigation could be positive if all recommended mitigation is put in place, and all areas of natural

vegetation are managed according to an OEMP and formally conserved within the Stewardship Program of CapeNature.

- It is strongly recommended that as part of the OEMP there be no livestock permitted in mapped areas of natural vegetation during the period May to end September. One of the primary reasons for this recommendation is that removal of grazing pressure will have a beneficial effect on the natural vegetation, particularly in terms of natural rehabilitation, in that flowering and seed set of the remaining natural plants (especially pioneers such as the annuals) will be significantly better in the absence of grazing (which removes the flowers). If the nearby annuals and other plants are not grazed this means that natural rehabilitation of the areas disturbed by the project will be significantly improved, as there will be more locally indigenous seed available nearby for establishment in the disturbed areas.
- Appropriate alien vegetation management is strongly recommended throughout the entire site.

7. IMPACT ASSESSMENT

Impacts may be both direct and indirect, with the former occurring mostly at the construction stage and the latter mostly at the operational stage.

In the case of this project the primary direct impact is loss of natural vegetation (and associated possible Species of Conservation Concern) within some of the development footprints. All hard infrastructure located within or partly within natural vegetation will result in the permanent loss of that vegetation. The primary sources of permanent loss include (based on the proposed layout) the five turbines WT3a, WT5a, WT17, 20, and 36; the access roads and cable trenches to these five turbines; and the substation (about 0.6ha, depending on where exactly it is located). Given that each turbine may result in about 400m^2 of local impact the five turbines located within natural vegetation will result in the loss of at least 0.20 ha of natural vegetation, to which should be added the figure for access roads and cable trenches to these five turbines, which could conceivably add up to another 1 ha of vegetation (depending on the length of road required). Thus as much as 1.2 ha of currently natural Renosterveld could be lost to direct infrastructural impacts.

The primary sources of temporary, long-term vegetation loss include excavation and soil piles for the cabling that will be adjacent to the internal access roads, crawler crane tracks along the above roads, and construction related impacts

adjacent to the internal access roads. It is estimated that between 3 and 5ha of natural Renosterveld vegetation could be temporarily lost to this source.

Loss of regionally rare and threatened plant species would have a regional impact, as would loss of regionally endemic vegetation types (Greyton Shale Fynbos and Western Ruens Shale Renosterveld). Although both these are direct impacts at the site scale they may have indirect consequences (impacts) at the regional scale. As the exact layout was not available at the time of the fieldwork it cannot be said whether or not any plant Species of Conservation Concern actually occurs within the proposed development footprints, but it is deemed likely that some do.

The indirect, negative botanical impacts are not likely to be critically important, but are likely to include a small degree of habitat fragmentation, possibly some siltation of existing drainage lines where roads cross these areas, and introduction and/or spread of invasive alien plants (mainly along access roads, due to soil disturbance caused). A further potential (but unlikely) indirect impact relates to the source of the gravel for the roads (sources have not yet been identified, although it is assumed that a commercial source will be used) – many gravel quarries are located close to or in Renosterveld areas (pers. obs.). This impact has been deemed to be unlikely as the soils in the area are not deep sands and should not need to be extensively graveled.

The indirect impacts noted above are thus a mix of those that occur at the site and at the regional scale.

7.1 Direct Impact: Permanent loss of natural vegetation

About 95% of the proposed development footprints within the study area will impact primarily on disturbed areas of no or very low botanical significance, but the infrastructure will also impact on relatively small areas (<1.2ha in total) of Western Ruens Shale Renosterveld and Greyton Shale Fynbos – the former a Critically Endangered vegetation type and the latter Vulnerable. Loss of any area of intact Critically Endangered vegetation should be strenuously avoided in any development application, as loss of any Critically Endangered vegetation will have a High negative impact, especially where the relevant vegetation type is likely to support various plant Species of Conservation Concern, such as on this site.

Much of the loss of Western Ruens Shale Renosterveld would occur in the footprint of likely internal access roads and the associated cable trenches, notably between turbines 2 and 4, between turbines 4 and 6, and between turbines 8 and 9. Although there is an existing farm track on the northeastern ridge this will need to be significantly upgraded to accommodate the abnormally large vehicles required to transport the turbine components to site. This upgrading will cause permanent loss of existing Renosterveld, perhaps totaling about 0.3ha. Additional sources of permanent habitat loss are the foundation areas for the five turbines located within natural or largely natural Renosterveld vegetation (WT3a, WT5a, WT17, 20, and 36). 3MW turbines require very large foundations, which displace large quantities of soil (and thus also vegetation).

Direct impacts on individuals of some of the possible plant Species of Conservation Concern are likely within all development footprints referred to above. This may result in a reduction in total number of these species on site by between 1 and 10% (estimated). In a regional context, these losses range from insignificant to low-medium significance.

Table 1

Nature of impact: Permanent loss of vegetation in footprint (up to about 1.2ha)

	Without mitigation	**With Mitigation**
Extent	Local and regional	Local
Duration	Permanent	Permanent
Magnitude	Moderate	Minor
Probability	Definite	Improbable
Significance	**Medium - High**	**Low**
Status	Negative	Negative
Is impact reversible?	No	No
Irreplaceable loss of vegetation?	Technically – yes (Critically Endangered vegetation type)	No
Can impacts be mitigated?		Yes

7.2 Direct Impact: Long term but temporary loss of natural vegetation

The existing natural vegetation may be severely disturbed (but not totally lost) in the areas adjacent to those referred to in Section 7.1: i.e. the substation construction; heavy machinery movement through some sensitive areas; road construction; and cable trench excavation through sensitive areas. Most of these areas should eventually recover to a significant degree (if natural vegetation is retained in the adjacent areas), but the crushed and dug up vegetation will take at least 12 years (and possibly much longer if rainfall is below normal) in order to recover to a point where at least 80% of the original diversity is once again present. Certain species may not return for many additional years, due to changes in soil structure (compaction or chemical changes). The impacts in this case thus rate as being long term.

Primary sources of temporary disturbance will be the construction of the foundations of the eight turbines within natural vegetation; construction of the substation; the large crawler crane that is used to erect the turbines, which has caterpillar tracks and a width of 13m; turning circles for long trucks; and the burying of the underground cabling on site.

Table 2:

Nature of Impact: Long term but temporary loss of natural vegetation

	Without mitigation	**With Mitigation**
Extent	Local and regional	Local
Duration	Long term	Long term
Magnitude	Low - Moderate	Minor
Probability	Definite	Improbable
Significance	**Medium - High**	**Low**
Status	Negative	Negative
Is impact reversible?	Mostly	No
Irreplaceable loss of vegetation?	No	No
Can impacts be mitigated?		Yes

7.3 Indirect impacts

Indirect ecological impacts are often difficult to identify, and even more difficult to quantify. In many cases baseline monitoring prior to the impacts is necessary in order to detect indirect impacts. Some possible indirect negative effects on the vegetation (shading, disturbance of wind flow, etc.) are likely to be minimal and are not assessed further.

Other indirect impacts are likely to be only moderately important, notably the likely disruption in optimal/natural fire regimes in the areas of natural vegetation, although this has probably already been partly disrupted by agriculture on site.

Fynbos and Renosterveld are both **fire** driven vegetation types that require fire at least once every 15 years, and fire dependant vegetation types are not generally compatible with embedded and costly infrastructural developments. If Shale Fynbos and Renosterveld are not burnt for over 40 years it can be assumed that at least 30% of the species will become locally extinct, including many of the Species of Conservation Concern. This is one of the many reasons why infrastructure should not be placed within areas of natural vegetation, and developments that take this into account (such as the current one) largely avoid this issue, although where the five proposed turbines within areas of natural vegetation are concerned this will obviously be an issue.

The effects of **habitat fragmentation** may also be important in some cases (including in the vicinity of the five problematic turbines), but the proposed development (after mitigation) should not result in significant further fragmentation of the remaining natural habitat on this site.

Perhaps the most important indirect impact is likely to be the spread of alien invasive vegetation (mainly grasses and herbs) into currently mostly natural areas of vegetation. This is likely to happen as a result of the soil disturbance associated with the development of the various new internal access roads and the associated cable trenches, and to a lesser extent the areas around the foundations for the five problematic turbines (turbines WT3a, WT5a, WT17, 20 and 36).

A further possible indirect impact is the source of road surfacing **material**. The gravel is usually quarried from borrow pits, which may be in sensitive ecological areas (often Renosterveld areas), and could have significant negative impacts if

not sourced from an appropriate area. However, at this stage the source, or indeed the need, has not been confirmed (and is deemed unlikely), and material would presumably be only from approved sites (although this does not mean that they are without impact).

Table 3:
Nature of Impact: Various indirect impacts - mainly alien invasive vegetation spread and minor habitat fragmentation

	Without mitigation	**With Mitigation**
Extent	Local	Local
Duration	Long term to Permanent	Long term
Magnitude	Low to Moderate	Low
Probability	Probable	Improbable
Significance	**Medium**	**Low**
Status	Negative	Negative
Is impact reversible?	Partly – in the case of fire.	Partly
Irreplaceable loss of vegetation?	Unlikely	Unlikely
Can impacts be mitigated?		Partially

7.4 Cumulative impacts

To some extent a cumulative impact is a regional impact, rather than the local site scale impact, *i.e*. if something has a regional impact it also has a cumulative impact.

The impacts of this type of development, and this development in particular, will be significantly less than for various existing and expanding agricultural operations in the region, as well as for the many unmanaged and expanding alien plant invasions on numerous properties in the area.

The proposed WEF thus has a fairly small but still important Low negative cumulative impact in the region, but this can be effectively mitigated on site by redesigning the layout as recommended to avoid the identified High sensitivity areas identified in previous sections, and further by formal conservation and

active management of the natural area on site. If effectively mitigated the overall effect could even be positive, due to the management of the areas of natural vegetation and the layout redesign.

7.5 Positive impacts

The primary positive impacts (see the two following paragraphs) will only come about if recommendations noted under Mitigation (Sects. 9 & 11) are effectively implemented and enforced.

If most of the natural vegetation on the site (exact extent not known, but estimated to be at least 250ha) is managed as a formal conservation area this would be a very positive local and regional impact. Western Ruens Shale Renosterveld is a very poorly conserved vegetation type (<1% of original extent conserved, with a national target of 29%), and thus any addition to the total area conserved is to be welcomed. Formal conservation of these natural areas is best achieved by signing these areas up as a Contract Reserve within the Stewardship Program of CapeNature, and details of this are provided in the Mitigation section below.

Seasonal removal of livestock from High sensitivity areas of vegetation on the site could have a positive effect on the natural vegetation, in that it would allow plants to flower and set seed more readily, without being heavily grazed. Disturbed areas will not only rehabilitate faster without livestock grazing but many rarer, currently heavily grazed species may have a chance of increasing their numbers. Heavy grazing and trampling can also lead to erosion, eutrophication of wetlands, etc.

The proposed WEF could have a slight positive impact in terms of helping to reduce CO_2 emissions by generating "clean energy".

8. IMPACT STATEMENT AND SUMMARY TABLE

Overall the proposed WEF is likely to have a Medium to High local (site scale; approx 3500 ha site) and Low to Medium regional (western Overberg; <100 000ha) negative impact on the vegetation on site, prior to mitigation. This could be reduced to Low negative (local) and Low negative (regional) after basic layout mitigation (this would be an acceptable level of impact), or even Low or Medium positive if most natural areas on site are formally conserved and managed (as recommended in this report).

The primary negative impacts on the site are mainly the result of direct impacts, including loss of natural, Critically Endangered or Vulnerable vegetation (<1.2ha) and possible associated Species of Conservation Concern in the development footprints, and medium to long term loss of natural vegetation (2-3ha) in adjacent areas that will be disturbed by heavy construction machinery, temporary dumping, etc. Most (but not all) of these impacts can be avoided / mitigated, by simply re-aligning the proposed layout in the five areas where this is an issue and where alternative alignments or positions are possible. In some cases it may not be possible to realign turbines and in that case it will be necessary to eliminate these from the proposed layout.

It should be noted that, even if the five problematic turbine positions are eliminated or relocated to low sensitivity areas, access roads and cable trenches will still need to cross three High sensitivity areas of natural vegetation on the main summit ridge, in order to connect three discrete areas of cultivated land. There will be unavoidable loss and damage to vegetation in these areas.

Indirect impacts are often difficult to quantify and measure, and are often equally difficult to avoid or mitigate. If the mitigation recommendations (See Sects. 9 & 11) are all implemented then indirect impacts on the vegetation on site could be reduced to Low negative.

The primary and important potential positive impact of the development will depend to a large degree on the proper management of the remaining natural vegetation on the sites (exact area unknown, but probably at least 250ha) as formal conservation areas under the Stewardship Program of CapeNature. The likelihood of this being implemented is not known, but is deemed to be relatively low, as the applicant is not the landowner, and this would thus require contractual agreements between landowner and applicant if the project goes ahead. An indirect positive impact is obviously the small contribution that this WEF would make to reducing CO_2 emissions, and the associated very small reduction in global warming effects.

Table 4: Overall summary table of proposed WEF impacts on vegetation on site (local scale)
Nature of Impact: Long term to permanent loss of Critically Endangered and Vulnerable vegetation and associated threatened species, as well as minor spread of alien invasive vegetation in disturbed areas.

	Without mitigation	**With Mitigation**
Extent	Local and regional	Local
Duration	Long term to Permanent	Mostly long term
Magnitude	Moderate	Minor
Probability	Definite	Improbable
Significance	**Medium - High**	**Low**
Status	Negative	Negative
Is impact reversible?	Not in direct building footprints (<1.2ha), but some are in other disturbance areas (2-3ha), although will take many years; indirect impacts difficult to reverse.	Not in direct building footprints (<1.2ha), but some are in other disturbance areas (2-3ha), although will take many years; indirect impacts difficult to reverse.
Irreplaceable loss of vegetation?	Yes, but relatively small areas	No
Can impacts be mitigated?		Yes

9. REHABILITATION GUIDELINES AND CEMP & OEMP REQUIREMENTS

Areas requiring rehabilitation will include all areas of natural or partly natural vegetation disturbed during the construction phase and that are not required for regular maintenance operations, or for cultivation. The main areas thus requiring rehabilitation will be recent disturbance to the edges of roads that pass through natural vegetation, the crawler crane tracks alongside the permanent 6m roads, and any cable routings where these fall within areas of natural vegetation. In addition, if any turbines are located within areas of natural vegetation (five

currently proposed) then the areas around these turbines will also require rehabilitation.

Rehabilitation should only commence once all construction related disturbance associated with the project has been completed.

Most of the ecological management of the site refers only to the High Sensitivity vegetation areas identified in the baseline report of Helme (2010). As the applicant does not plan to buy the land, these requirements will thus involve contracts between the applicant and the landowners, who will presumably continue to farm most of the land.

Detailed requirements for the Construction Phase Environmental Management Plan (CEMP) are as follows:

1) If any infrastructure is to be placed within the identified areas of High botanical sensitivity (all area of extant Renosterveld or Shale Fynbos) all these development footprints (for roads, buildings, underground cables, laydown areas and turbine footings) should be surveyed and fenced off with two strand wire and clearly indicated with flags and/or coloured ropes. Only once this has been done can anything else proceed. It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas, at least not without the permission of the ECO. Areas of particular concern are areas of natural vegetation along the summit ridge between turbines 1 and 9 through which roads and cable trenches will have to run.

Objective: Fencing of development footprints in sensitive areas in order to minimise disturbance to adjacent sensitive areas and to make it clear to contractors where they should and should not go.

Project component/s	All phases of construction
Potential impact	Substantially increased damage to adjacent sensitive vegetation, due largely to ignorance of where such areas are located.
Activity risk/source	There is no reason why this objective should not be achieved.
Mitigation: target/objective	No loss of or damage to sensitive vegetation in areas outside immediate development footprint; <0.1ha of construction related disturbance in sensitive areas

	outside fenced footprints; measured monthly during duration of construction.

Mitigation: Action/control		Responsibility	Timeframe
Two strand wire or coloured rope fencing with droppers every 10m, demarcating all allowable development footprints and corridors in areas of natural vegetation; signage saying "Sensitive Area – Keep Out" placed on these fences every 50m.		ECO	To be completed prior to any construction related activity on site; auditing monthly.
Performance indicator	No damage to surrounding natural vegetation		
Monitoring	ECO to monitor all construction areas on a weekly and monthly basis until all construction is completed; immediate report backs to site manager; and ECO to speak to contractors responsible for any infringements		

2) Prior to any earthworks within High sensitivity Renosterveld or Shale Fynbos areas a plant Search and Rescue program should be undertaken. Note: Provided that all recommended mitigation is put in place this should only be applicable in very limited areas. Search and Rescue (S&R) of certain translocatable, selected succulents, shrubs and bulbs occurring in long term & permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and turbine positions) should take place. All such development footprints must be surveyed and pegged out as soon as possible, and then a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R (Adriaan Hanekom of Caledon Wildflower Nursery is recommended). All rescued species should be bagged (and cuttings taken where appropriate) and kept in the horticulturist's nursery, and should be returned to site once all construction is completed and rehabilitation of disturbed areas is required. Replanting should only occur in autumn or early winter (April – May), once the first rains have fallen, in order to facilitate establishment. Genera that can be considered for rescue are all bulbs and tuberous species plus selected specimens of succulents such as *Ruschia* and *Lampranthus* species.

Objective: Search and Rescue of all translocatable indigenous plants from development footprints prior to any development, and maintenance of these in a

nursery for use in rehabilitation in disturbed areas on completion of all construction.

Project component/s	All phases of construction; replanting during main post construction phase		
Potential impact	Substantially increased loss of natural vegetation at construction phase and waste of on-site plant resources, and lack of locally sourced material for rehabilitation of disturbed areas; increased cost of having to buy in material for rehabilitation.		
Activity risk/source	There is no reason why this objective should not be achieved, although it will carry cost implications (and savings)		
Mitigation: target/objective	Rescue, maintenance and subsequent replanting of at least 20% of the natural vegetation in all development footprints within any areas of High sensitivity natural vegetation on site.		
Mitigation: Action/control		Responsibility	Timeframe
Plants that can be considered for rescue are all bulbs and tuberous species, plus selected specimens of succulents such as *Ruschia* and *Lampranthus* species. Material to be bagged up or stored in suitable conditions in a greenhouse (with irrigation where needed); to be replanted in areas requiring rehabilitation in May/June following cessation of all construction related disturbance in particular area.		ECO and appointed horticultural subcontractor	Search and Rescue to be completed in all areas of natural vegetation prior to any construction related activities in these areas; maintenance of material in nursery until May following cessation of disturbance, and replanting of material in May/June.

Performance indicator	Horticulturist to submit list of target species to botanist for approval; rescue of material; replanting in

	rehabilitation areas to cover 20% of these areas within 3 months of replanting
Monitoring	ECO to monitor Search and Rescue; horticulturist to liase with botanist; botanist to review rehabilitation success after 3 months of replanting of rehabilitation areas.

3) An ECO must be present during the duration of the construction phase.

4) Any excavation within designated High sensitivity areas, including those for cables, must be supervised by the ECO. No excavations may be left open for more than 1 week, and they should preferably be closed up within 1 day, using the carefully stockpiled soil that came out of the trench.

Objective: Minimise disturbance associated with cabling and trench digging in High sensitivity areas; maximise rehabilitation success of these disturbed areas

Project component/s	All phases of construction; rehabilitation immediately post disturbance cessation	
Potential impact	Substantially increased disturbance to areas around cabling trenches and reduced rehabilitation success; open trenches have negative impact on fauna	
Activity risk/source	There is no reason why this objective should not be achieved	
Mitigation: target/objective	Minimise period of soil stockpiling alongside trenches and make sure that it is less than one week before trenches are infilled and rehabilitated; target should be one day.	
Mitigation: Action/control	Responsibility	Timeframe
All cable trenches, etc, through sensitive areas should be dug by hand in order to minimise damage to surrounding areas; all stockpiled sand should be replaced within one week of trench opening.	ECO and appointed horticultural subcontractor	Infilling to be complete within one week of cable trench commencement (ideally within 1 day); rehabilitation to be undertaken within one week of infilling.

Performance indicator	Trenches should ideally not disturb an area more than 3m wide in total (including soil pile areas); trenches should not lie open for more than 7 days and should ideally be closed up the same day.
Monitoring	ECO to monitor trenching and rehabilitation; horticulturist to liase with botanist about rehabilitation; botanist to review rehabilitation success after 3 months of sowing in rehabilitation areas, and to recommend additional measures if rehabilitation deemed insufficient.

5) No dumping or temporary storage of any materials may take place outside designated and demarcated laydown areas.

6) Only suitable locally indigenous Western Ruens Shale Renosterveld species should be used for rehabilitation or planting anywhere on site. This means that no exotic or invasive species should be used for rehabilitation, and this includes commonly used invasive grass species such as ryegrass (*Lolium* spp).

Operational Phase EMP Requirements:

7) It is strongly recommended that the landowners should refrain from grazing livestock in the High sensitivity vegetation areas (all extant Renosterveld and Fynbos areas; as mapped in Helme 2009) in the main winter and spring growing and flowering periods (1 May – end October). One of the primary reasons for this is that removal of livestock grazing pressure will have a beneficial effect on the natural vegetation, particularly in terms of natural rehabilitation, in that flowering and seed set of the remaining natural plants (especially pioneers such as the annuals) will be significantly better in the absence of grazing (which removes the flowers). If the nearby annuals and other plants are not grazed this means that natural rehabilitation of the areas disturbed by the project will be significantly improved, as there will be much more locally indigenous seed available nearby for establishment in the disturbed areas, and the site may also act as a seed source for some nearby overgrazed areas.

Objective: No grazing of livestock in the High sensitivity vegetation areas in the main winter and spring growing and flowering periods (1 May – end October).

Project component/s	Construction and Operational phase; ongoing		
Potential impact	Grazing and trampling substantially decreases rehabilitation success, posing a risk of erosion and biodiversity loss; grazing and trampling impacts negatively on flowering and seed set of many rare plant species		
Activity risk/source	There is no reason why this objective should not be achieved, but it would require cooperation from the landowners		
Mitigation: target/objective	Ecologically functional and flourishing natural vegetation in the area, with rare species flowering and setting seed successfully.		
Mitigation: Action/control		Responsibility	Timeframe
Removal of all livestock from all High sensitivity areas of natural vegetation on site from 1 May to end October.		ECO (construction phase) and CapeNature (if involved), site manager and landowners (operational phase)	Ongoing from construction into operational phase
Performance indicator	No livestock on site in High sensitivity areas of natural vegetation during period 1 May to end October. No evidence of grazing or trampling in these areas during this period, and good flowering and seed set in palatable plant species.		
Monitoring	Botanist to review regeneration and seed set success in palatable species every two years, and to check site for compliance in terms of livestock.		

8) All temporary fencing and coloured rope should be removed once the construction phase has been completed.

9) Ongoing alien plant monitoring and removal should be undertaken on all areas of natural vegetation within the project area on an annual basis, with emphasis on areas within 200m of any infrastructure. DWA approved methodology should be employed for all alien clearing operations. No earthmoving machinery should

be used for this purpose, as this disturbs the soil and creates ideal conditions for re-invasion. All stems of resprouting species (notably *Acacia saligna*) must be cut as close to ground level as possible, using loppers or chainsaws (depending on size), and stumps must be immediately hand painted with a suitable Triclopyr herbicide (e.g. Garlon, Timbrel, with colour dye) to prevent resprouting. If this is not done within 5 minutes of being cut *Acacia saligna* will resprout, wasting the original effort. No herbicide spraying should be undertaken anywhere within natural vegetation, due to the extensive collateral damage. All cut branches should be stacked into a pyramid (cut ends up) and left to dry – where rodents will eat the available seed under the pile, reducing seed germination. Annual follow ups are required in all areas that have been previously cleared. Small seedlings may be hand pulled.

Objective: Removal of all woody alien invasive vegetation within the project area, within two years of project commencement, and particularly within the High sensitivity areas of natural vegetation. To be undertaken from project inception, on an ongoing basis.

Project component/s	Construction and Operational phase; ongoing		
Potential impact	Woody alien invasive vegetation is currently a relatively minor threat to the site. Alien vegetation may displace rare species, dry out wetlands, and result in habitat loss, as well as increasing the fuel load and the consequent risk of a wildfire. If unchecked the alien vegetation could come to dominate certain areas within 20 years, with loss of rare species.		
Activity risk/source	There is no reason why this objective should not be achieved, although it will be costly, and adequate budget must be made available for ongoing clearing costs.		
Mitigation: target/objective	Ecologically functional natural vegetation in High botanical sensitivity portions of site; all High Sensitivity areas within 200m of any infrastructure are clear of alien vegetation within 2 years of project inception.		
Mitigation: Action/control		Responsibility	Timeframe
DWA approved methodology should be employed for all alien clearing operations. Dense areas should be tackled last – the priority is to prevent their spread, and then gradually clear the		ECO (construction phase) and appointed alien clearing contractors	Ongoing from construction into operational phase. High sensitivity areas

entire area, maximising cost efficiency. Areas should not be burnt until an area has been clear for at least one year, in order to prevent coppicing and massive seed germination. *Acacia saligna* (Port Jackson), *Hakea sericea* (silky hakea) and *Pinus radiata* (pine) are the primary invasive aliens. No bulldozing or removal by any machinery is allowed, as this disturbs the soil and creates ideal conditions for re-invasion. All stems must be cut as close to ground level as possible, using loppers or chainsaws (depending on size), and stumps must be immediately hand painted with a suitable Triclopyr herbicide (e.g. Garlon, Timbrel, with colour dye) to prevent resprouting. If this is not done within 5 minutes of being cut Port Jackson will resprout, wasting the original effort. No herbicide spraying should be undertaken anywhere, due to the extensive collateral damage. All cut branches should be stacked into a pyramid (cut end up) and left to dry – where rodents will eat the available seed under the pile, reducing seed germination. Annual follow ups are required in all areas that have been previously cleared (to be undertaken Oct-April). Small seedlings may be hand pulled.	(operational phase and perhaps also overlapping with construction phase)	should be cleared initially only from November - April; and all follow ups only from Oct – April, to minimise damage to seasonal species
Performance indicator	All High Sensitivity areas of vegetation within 200m of infrastructure to be cleared of invasive aliens within 2 years of project inception (initial clearing); <1% alien cover in these areas in following years	
Monitoring	Annual audits of alien clearing by independent botanist or CapeNature representative (if involved) to determine	

	compliance, and to suggest any changes to program

10) No invasive alien grasses may be used for rehabilitation of natural vegetation areas. This means no *Lolium* species (ryegrass), *Avena* (oats), or *Pennisetum clandestinum* (kikuyu grass). All rehabilitation should be done using only locally indigenous Renosterveld plant species.

11) The applicant must ensure that there is sufficient budget to implement all management recommendations noted above.

10. CONCLUSIONS

- There are two natural vegetation types on site, one of which is regarded as Critically Endangered on a national basis and the other Vulnerable, and most of the remaining areas of natural vegetation can be expected to support various plant Species of Conservation Concern. Significant portions of the study area support vegetation in medium to pristine condition, and were mapped as being of High sensitivity in the baseline study of Helme (2009). Ideally no development should occur within identified High sensitivity areas, and all infrastructure should ideally be located at least 30m from the edge of these High sensitivity areas. The majority of the study area (>60%) is cultivated or disturbed land of Low botanical sensitivity, and presents no botanical constraints to the proposed facility.
- Overall the proposed WEF is likely to have an unacceptable Medium – High negative impact on the vegetation on site, prior to mitigation. This could easily be reduced to an acceptable Low negative level with basic mitigation involving realignment or removal of eight turbines and associated infrastructure.
- The proposed WEF could even have a Low or Medium positive impact if all areas of High sensitivity vegetation in the study area are managed appropriately (annual alien vegetation management, no grazing in winter – spring flowering season), and are formally conserved within CapeNature's Stewardship Program. The likelihood of this happening is however not known, and is considered to be low, as it would require negotiated contracts between the landowners, the applicant and CapeNature.
- If the essential mitigation and the CapeNature Stewardship Program recommendation is all implemented then this project could potentially

serve as an example of best practice wind energy facility development and management.

11. ESSENTIAL SITE SPECIFIC MITIGATION

- All infrastructure must be located within existing areas of Low sensitivity (see Helme 2009), as far as possible. This means that some relocation of infrastructure out of Critically Endangered and Vulnerable natural vegetation remnants will be necessary.
- Turbines WT3a, WT5a, WT17, 20, and 36 must be relocated to Low sensitivity areas (*i.e.* currently cultivated areas) or eliminated altogether, as they all are located within natural or partly natural areas of Renosterveld vegetation. The associated internal access roads and cable trenches to these five turbines will also need to be relocated outside of High sensitivity areas of natural vegetation.
- The access road and cable trench to turbine 14a must be rerouted at least 110m to the southwest to avoid crossing the 180m long section that it currently traverses through High sensitivity Renosterveld vegetation. Similarly, the proposed cable trenches to turbines 23 and 24 are shown running through High sensitivity Renosterveld vegetation for at least 180m, and must be properly aligned with the proposed access roads, outside areas of currently natural vegetation.
- Both the proposed Phase 1 and 2 (both alternatives) substation positions are entirely within currently cultivated land and are thus acceptable from a botanical perspective, with negligible botanical impacts.
- An ECO must be permanently on site throughout the road construction, cable laying, turbine foundation excavation, and during the erection of the turbines, and at other times should visit the site at least once a week until the construction phase is completed.
- Any excavation, including those for cables, must be supervised by the ECO. No excavations may be left open for more than 1 week, and they should preferably be closed up within 1 day, using the carefully stockpiled soil that came out of the trench. In the case of turbine footings some $45m^3$ of soil will presumably be displaced by the concrete, and this should not be dumped on any natural vegetation.
- No dumping or temporary storage of any materials may take place outside designated and demarcated laydown areas, and these must all be located within areas of Low botanical sensitivity (agricultural areas).

- All feasible (as determined by CapeNature) areas of High botanical sensitivity (identified in the Scoping study of Helme 2009) must be formally declared and registered as a Contract Nature Reserve/s with CapeNature's Stewardship Program, within one year of project initiation (defined as installation of the first project related infrastructure; subject to CapeNature capacity in the area). This may entail a rezoning of these areas (to Open Space), and will require that a management plan for these areas is drawn up, which should include the clause that these areas may not be grazed by livestock between 1 May and end October. In some cases small, isolated patches or strips of mapped High sensitivity habitat may not be deemed feasible or suitable by CapeNature, and in this case these areas could then be excluded from the final Contract Reserve. Significant financial incentives are available for landowners who register land as a Contract Reserve, including write-offs of the management costs and portions of the capital costs, and a reduction in annual Land Tax. Associated with these benefits are requirements for a management plan and environmental auditing to ensure that management is adequately carried out. In this case all costs associated with rezoning and management of these areas will remain the responsibility of the applicant and/or landowners.
- The contract between the landowner/s and the applicant must include the relevant clauses concerning the need for CapeNature Stewardship Program involvement in the identified priority conservation areas on the site (as outlined in the previous bullet). The independent botanist and the CapeNature Stewardship Program coordinator must both confirm in writing that these clauses are in the contract, within 3 months of any authorisation.
- Both the botanist and the CapeNature Stewardship Coordinator must verify in writing, within 1 yr of project inception, that the Stewardship Program commitments involving both the landowner/s and the applicants have in fact been adequately implemented.
- A CEMP and OEMP should be drawn up, which must outline management steps for all the areas of natural vegetation on the site. See Section 10 for detailed guidelines.
- A botanist familiar with the vegetation of the area should ensure that adequate botanical inputs are made into the construction and operational phase EMPs.

12. REFERENCES

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Pri.Sci.Nat # 400045/08

30 Sep 2011

Arcus Gibb

ATT: Rebecca Thomas

Dear Rebecca

Addendum to Botanical Impact Assessment and Comment on revised layout of proposed Caledon WEF (Genesys Energy/Caledon Wind)

Thank you for asking me to comment on the revised, final layout as provided to us on 29 Sep 2011. Images of the revised layouts are included as Figures 1 & 2. A total of 67 turbines are indicated in the final layout, as opposed to the 74 assessed in the February 2011 Botanical Impact Assessment.

Figure 1: Northern parts of the final layout as assessed.

Figure 2: Southern parts of the final layout as assessed.

I note that, as per recommendations contained in my Feb 2011 report, turbines 3a and 5a have been removed, and that 36 has been moved out of the sensitive area.

However, turbines 17 and 20 were not moved out of High sensitivity areas, as was recommended. My recommendations to move the roads and cable trenches to turbines 14a, 23 and 24, in order to stay out of the sensitive Renosterveld, have also not been put in place.

This inconsistency in terms of responding to identified issues is concerning, as the cumulative negative botanical impact of the overall development is an issue, and is the primary reason for the Medium to High negative botanical assessment (IA February 2011).

I have prepared a Table outlining all areas of botanical concern in terms of the latest layout, and this is included below as Table 1. Recommendations for mitigation are included for each point of issue.

I would strongly suggest that either these all be addressed prior to finalisation of the layout and the IA, or that they be noted by DEA in any RoD as outstanding issues that need to be resolved prior to final approval.

Table 1: Areas of botanical concern associated with latest layout.

Area	Concern	Recommendation for Mitigation
Turbine 17 and laydown area	Located in High sensitivity Renosterveld vegetation	Move at least 90m west, out of Renosterveld
Turbine 20 and laydown area	Located in High sensitivity Renosterveld vegetation	Move at least 100m south, out of Renosterveld
Road and cable trench between turbines 2 and 4	Located partly in High sensitivity Renosterveld vegetation	Only solution would be to remove turbines 1 & 2, doing away with need for road and trench
Road and cable trench between turbines 4 and 6	Located partly in High sensitivity Renosterveld vegetation	Only solution would be to remove turbine 4, doing away with need for road and trench
Road and cable trench between turbines 8 and 9	Located partly in High sensitivity Renosterveld vegetation	Move road and trench 40m south onto existing edge of cultivation
Road and cable trench to turbine 14	Located partly in High sensitivity Renosterveld vegetation	Move 140m south into edge of existing cultivation
Road and cable trench between turbine 38 and 14	Located partly in High sensitivity Renosterveld vegetation	Nothing seems feasible - no alternatives
Overhead cable between turbines 17 and 36	Located partly in High sensitivity Renosterveld vegetation	Minimise disturbance of natural vegetation
Road and cable trench to turbine 20	Located partly in High sensitivity Renosterveld vegetation	Consolidate road and cable trench; keep them together
Laydown area between turbines 23 and 36	Located partly in High sensitivity Renosterveld vegetation	Make sure Renosterveld portion is not impacted; or move
Cable trench to turbine 23	Located entirely in High sensitivity Renosterveld vegetation	Move next to road, on southeast side of road
Cable trench to turbine 24	Located partly in High sensitivity Renosterveld vegetation	Move next to road, on southeast side of road
Cable trenches between turbines 24 and 25	Located partly in High sensitivity Renosterveld vegetation	Keep cable trenches within road
Cable trench between turbines 35 and 36	Located partly in High sensitivity Renosterveld vegetation	Minimise disturbance of natural vegetation
Laydown area east of turbine 36	Located partly in High sensitivity Renosterveld vegetation	Keep laydown area within cultivated lands
Laydown area north of turbine 23	Located partly in High sensitivity Renosterveld vegetation	Keep laydown area within cultivated lands

As should be clear from this table not all areas of concern can be entirely avoided, and there will still be a significant residual botanical impact associated with this development, even if all of the above is put in place.

I thus stand by my initial assessment of the proposed development as likely to have a Medium to High negative botanical impact prior to mitigation, and Low negative after mitigation.

In addition, all other mitigation noted in my Feb 2011 IA report still stands and should be both required and implemented.

Yours sincerely

Nick Helme